ORIGINAL ARTICLE

Psychometric properties of the Brazilian version of the Standard Precautions Questionnaire for health professionals in Brazil

Propriedades psicométricas da versão brasileira do Standard Precautions Questionnaire para profissionais de saúde no Brasil

Propiedades psicométricas de versión brasileña del Standard Precautions Questionnaire para profesionales de salud de Brasil

Thais Duarte da Costa de Luna[I]
ORCID: 0000-0003-3388-0078

Fernanda Maria Vieira Pereira-Ávila[I]
ORCID: 0000-0003-1060-6754

Priscila Brandão[I]
ORCID: 0000-0002-2635-9121

Estelle Michinov[II]
ORCID: 0000-0001-5872-2450

Fernanda Garcia Bezerra Góes[I]
ORCID: 0000-0003-3894-3998

Natália Maria Vieira Pereira Caldeira[III]
ORCID: 0000-0002-4231-7116

Elucir Gir[III]
ORCID: 0000-0002-3757-4900

[I]*Universidade Federal Fluminense. Rio das Ostras, Rio de Janeiro, Brazil.*
[II]*Université Rennes 2. Rennes, França.*
[III]*Universidade de São Paulo. Ribeirão Preto, São Paulo, Brazil.*

Corresponding author:
Thais Duarte da Costa de Luna
E-mail: lathaisduarte@gmail.com

ABSTRACT

Objectives: to evaluate the psychometric properties of the Brazilian version of the Standard Precautions Questionnaire. **Methods:** this is a methodological study conducted with physicians and nursing professionals for the evaluation of psychometric properties. A reliability analysis was conducted using Cronbach's alpha. Exploratory factor analysis was performed and scores were analyzed using the known-groups method. **Results:** the scale was applied to 300 professionals: 88 nurses, 163 nursing technicians and 49 physicians. Cronbach's alpha was 0.71. All items presented satisfactory factor loading. Known-group validity showed sensitivity of differences in the scores of socio-cognitive factors, where nurses obtained a significant effect in scores of intention (4.77; p=0.000) and individual constraints (3.52; p=0.041) when compared to other health professionals. **Conclusions:** satisfactory construct reliability and validity were obtained for the Brazilian version of the questionnaire, allowing a valid and reliable instrument for the assessment of socio-cognitive determinants of compliance with standard precautions.
Descriptors: Health Personnel; Universal Precautions; Nursing Methodology Research; Validation Studies; Psychometrics.

RESUMO

Objetivos: avaliar as propriedades psicométricas da versão brasileira do *Standard Precautions Questionnaire* **Métodos:** estudo metodológico para avaliação das propriedades psicométricas, realizado entre médicos e profissionais de enfermagem. Para a confiabilidade, utilizou-se Alfa de Cronbach. Foram realizadas análise fatorial exploratória e análise dos escores por grupos conhecidos. **Resultados:** a escala foi aplicada para 300 profissionais, 88 enfermeiros, 163 técnicos de enfermagem e 49 médicos. O Alfa de Cronbach foi 0,71 para o instrumento. Todos os itens apresentaram carga fatorial satisfatória. A validade de construto por grupos distintos evidenciou sensibilidade das diferenças dos escores dos fatores sociocognitivos em que enfermeiros obtiveram efeito significativo nas pontuações de intenção (4,77; p=0,000) e restrições individuais (3,52; p=0,041), quando comparados aos demais profissionais. **Conclus**ões**:** obtiveram-se confiabilidade e validade de construto satisfatórias para a versão brasileira do questionário, sendo possível dispor de um instrumento válido e confiável para avaliar determinantes sociocognitivos na adesão às precauções-padrão.
Descritores: Pessoal de Saúde; Precauções Universais; Pesquisa Metodológica em Enfermagem; Estudos de Validação; Psicometria.

RESUMEN

Objetivos: evaluar las propiedades psicométricas de la versión brasileña del *Standard Precautions Questionnaire*. **Métodos:** estudio metodológico para evaluar las propiedades psicométricas, realizado entre médicos y profesionales de enfermería. Para confiabilidad se aplicó Alfa de Cronbach. Se realizó análisis factorial exploratorio y análisis de puntajes por grupos conocidos. **Resultados:** la escala fue aplicada a 300 profesionales de salud: 88 enfermeros, 163 auxiliares de enfermería y 49 médicos. Para Alfa de Cronbach fue 0,71. Todos los ítems mostraron carga factorial satisfactoria. La validez del constructo por grupos evidenció sensibilidad para diferencias de puntaje en factores sociocognitivos, obteniendo los enfermeros efecto significativo en puntajes de intención (4,77; p=0,000) y restricciones individuales (3,52; p=0,041) al comparárselos con los otros profesionales. **Conclusiones:** confiabilidad y validez satisfactorias del constructo en la versión brasileña del cuestionario, disponiéndose de un instrumento válido y confiable para evaluar determinantes sociocognitivos en adhesión a las precauciones estándar.
Descriptores: Personal de Salud; Precauciones Universales; Investigación Metodológica en Enfermería; Estudios de Validación; Psicometría.

INTRODUCTION

Standard precautions (SPs) consist of measures to be adopted by health professionals to reduce the risk of infection and occupational accidents. The adoption of these measures can reduce occupational risks, morbidity and mortality due to cross-transmission of infectious diseases, further reducing health care costs[1].

According to Brazilian Regulatory Standard 32 (NR32), SPs include the use of personal protection equipment (PPE), such as gloves, masks, safety glasses, caps, closed-toe shoes and aprons, in situations involving potential contact with body fluids of patients, except for sweat[2].

In addition, SPs include procedures like hand washing, handling sharp materials, environmental recommendations, and handling materials that are in contact with the patient. NR32 regulates the adoption of SPs by health professionals, their training, and supply of all materials required for their protection while performing their work activities[2].

However, recent studies show insufficient adherence to SPs among health professionals. Low adherence is related to several factors, including excessive self-confidence, personal beliefs, emergencies, unsatisfactory knowledge, and outdated professional knowledge[3-7].

Several factors have been identified as obstacles to the adoption of SPs, with the literature presenting only few studies that assess the behavior of professionals in relation to the factors that influence compliance with the SPs. Considering the above, understanding the reasons and obstacles involved in non-compliance with these measures is critical for the development of strategies and programs to encourage a safety culture among health professionals[8-9]. Thus, assessing such factors among health professionals in Brazil is also relevant. The Standard Precautions Questionnaire (SPQ) is an instrument validated in France that aims to assess the socio-cognitive determinants of compliance with SPs, including individual and organizational attitudes, behaviors, limitations and constraints[10].

The SPQ was translated and culturally adapted to Brazil, resulting in the Brazilian Version of the Standard Precautions Questionnaire (SPQ-PB)[11]. Considering that, in Brazil, there is no validated instrument specifically developed to assess the socio-cognitive determinants of compliance with SPs among health professionals, its psychometric properties must be evaluated, which consists of methods to assess the quality of an instrument previously adapted and the meaning of answers provided in the questionnaire[12-13].

OBJECTIVES

To evaluate the psychometric properties of the Brazilian Version of the Standard Precautions Questionnaire (SPQ-PB) for health professionals in Brazil.

METHODS

Ethical aspects

Authorization was obtained from the SPQ author to adapt and validate the instrument in Brazil. An informed consent form, a form with sociodemographic and professional information and the SPQ-PB scale were delivered in an envelope. The project was approved by the Research Ethics Committee (CAAE: 61213916.4.0000.5243; authorization nº 1.813.611). All ethical aspects were considered according to the recommendations of Resolution 466/12 of the National Health Council.

Study design, site and period

This was a methodological quantitative study conducted in two hospitals: one located in the metropolitan region and one located in the coastal region of the state of Rio de Janeiro, from April 2018 to February 2019.

The hospitals offer different specialty services, including pediatrics, gynecology and obstetrics, internal medicine, clinical surgery, and adult intensive care, and perform emergency procedures, elective surgeries and laboratory and imaging exams.

Study population or sample: inclusion and exclusion criteria

In total, around 400 physicians and nursing professionals were selected from the following sectors: internal medicine, clinical surgery, pediatrics, intensive care and gynecology/obstetrics. The inclusion criteria were: health professionals should be physicians or nursing professionals, and they should provide patient care. Health professionals working exclusively in administrative activities were excluded. The study sample was created through a random selection of 300 health professionals. According to the literature, a sample of 200 to 300 participants is recommended for a satisfactory assessment of the psychometric properties of an instrument[14].

Study protocol

Data collection was conducted individually in a reserved area of each sector, when the professionals were available to answer the study instrument.

The SPQ-PB version was applied, as well as a sociodemographic questionnaire to collect information such as sex, age, education, profession, sector, participation in training, and how the professional became aware of SPs.

The SPQ is a questionnaire of 24 items that are grouped into 7 dimensions: 1- Exemplary behavior (2 items); 2- Organizational constraints (4 items); 3- Intention to perform standard precautions (4 items); 4- Social influence (4 items); 5- Attitude toward standard precautions (3 items); 6- Facilitating organization (3 items); 7- Individual constraints (4 items).

The items are visually organized into 5 parts: 1- Knowledge about SPs; 2- Work environment; 3- Factors that enable compliance with SPs; 4- Factors that hinder compliance with SPs; and 5 - Intention to comply with SPs.

Part 1 addresses the individual behavior related to compliance with the SPs, part 2 has four items about the work environment and discusses warnings that health professionals may receive from colleagues in case of failure to comply with SPs.

Part 3 addresses the factors that enable compliance with SPs, such as availability of equipment, training and behavior of professionals and colleagues toward SPs.

Part 4 discusses factors that prevent compliance with SPs, such as adverse events that may interfere in the work process, for instance, workload, protocol complexity, and lack of time to

observe SPs. Part 5 is related to the intention to follow SPs even with some obstacles, such as lack of time or emergencies. The original version of the instrument was tested and the psychometric properties were considered satisfactory[10].

The participants were instructed by the study team on how to fill in the instruments and seal the envelope after completion. The envelopes were collected after they were sealed separately from the informed consent form.

Analysis of results and statistics

Data analysis was performed using descriptive statistics with measures of central tendency (mean, median) and dispersion (standard deviation) in IBM® SPSS, version 19.0.

Reliability was measured through an evaluation of internal consistency by Cronbach's alpha coefficient (α), with values above 0.70 considered adequate[15].

Construct validity was performed through exploratory factor analysis to identify the instrument factors, using Varimax rotation for the determination of factors, and the Kaiser-Meyer-Olkin (KMO) sampling adequacy test, with values above 0.70 considered adequate. Values closer to 1 indicate better results and a more adequate sample for the factor analysis. For Bartlett's test of sphericity (AIC), $p < 0.00$[16-17] was considered.

For the determination of the number of factors to be extracted, eigenvalues were adopted, considering eigenvalue ≥ 1 and explained variance[17-18]. The items were allocated and confirmed in the dimensions, considering the factor loading ≥ 0.30[12].

Also, the comparison between known groups used scores from the SPQ-PB domains and the professional categories.

The score was calculated based on the mean of the answers obtained on a 5-point Likert scale. Analysis of variance (ANOVA) was adopted to compare the mean values.

RESULTS

Sociodemographic characteristics of the study sample

The SPQ-PB was applied to 300 health professionals from the institutions participating in the study: 88 (29.3%) nurses, 163 (54.3%) nursing technicians, and 49 (16.3%) physicians. The sample had more female than male professionals, 236 (78.7%) and 64 (21.3%), respectively.

The mean age was 41 years (SD=10.1), with a maximum of 69 years and a minimum of 23 years. Regarding employment, 136 (45.3%) reported having one job, 134 (44.7%) had two jobs and 29 (9.7%) had three jobs. The average number of hours worked per week was 48 (SD=18.3), with a minimum of 20 hours, and a maximum of 120 hours. Regarding professional experience, the mean was 14 years (SD=9.4), with a minimum of 1 year and a maximum of 44 years.

In terms of knowledge about SPs, 151 (50.3%) answered that they learned about this topic at school and in lectures at the hospital, 126 (42.0%) only at school/university, and 23 (7.7%) in lectures at the

hospital. A little more than half of the participants (154; 51.3%) answered that they had not received training about SPs. They were asked if they felt sufficiently trained, 146 (48.7%) answered yes, 126 (42.0%) answered reasonably, and 27 (9.0%) said no.

Most health professionals were from internal medicine (100; 33.3%), whereas the others were from several sectors, such as pediatrics (66; 22.0%), clinical surgery (59; 19.7%), intensive care (43; 14.3%), and gynecology/maternity (32; 10.7%).

Evaluation of psychometric properties

In the reliability analysis of the SPQ-PB, Cronbach's alpha was 0.71 for all 24 items.

To start the process of construct validity through exploratory factor analysis, KMO=0.75 and 2430.595 (p=0.000) in Bartlett's sphericity test were obtained, showing a satisfactory correlation for factor analysis. The eigenvalues obtained with 7 factors accounted for 65.75% of the variance of the construct.

The scree plot in Figure 1 shows seven factors presenting eigenvalues above 1, indicating adequacy of the construct in 7 factors.

All items presented factor loading above 0.30, thus no item had to be excluded. In addition, all items were allocated to the same factors, according to the original version of the SPQ (Table 1).

The following items *1- Standard precautions are effective in reducing health care infection*; *2- If I follow the protocol of standard precautions, I will protect my patients from infection*; and *3- Following the standard precautions protocol will protect me from infection* were grouped under the factor 'attitudes'.

Items *4- Most of my colleagues think it is important to adhere to standard precautions*; *5- I will be reprimanded by the charge nurse if I do not adhere to standard precautions*; *6- I will be reprimanded by infection control link nurses if I do not adhere to standard precautions*; and *7- I will be reprimanded by the physicians if I do not adhere to standard precautions* were grouped under the factor 'social influence'.
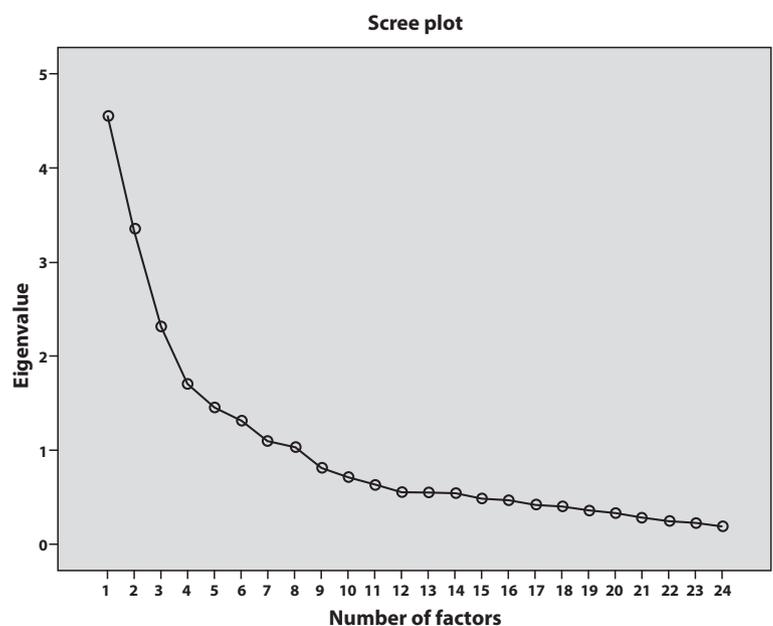

Figure 1 – Scree plot of eigenvalues and number of factors of the matrix, Rio das Ostras, Rio de Janeiro, Brazil, 2018-2019

Table 1 - Varimax rotation matrix of factors from the Brazilian version of the scale, Rio das Ostras, Rio de Janeiro, Brazil, 2018-2019

Items				Factors			
	1 Intention	2 Social influence	3 Organizational constraints	4 Organization	5 Individual constraints	6 Attitudes	7 Exemplary behaviors
01						0.61	
02						0.71	
03						0.73	
04		0.35					
05		0.75					
06		0.91					
07		0.58					
08				0.74			
09				0.83			
10				0.58			
11							0.55
12							0.97
13			0.52				
14			0.84				
15			0.70				
16			0.47		0.31		
17					0.48		
18					0.70		
19					0.62		
20					0.54		
21	0.74						
22	0.85						
23	0.56						
24	0.64						
Eigenvalues	4.55	3.35	2.31	1.69	1.45	1.30	1.10
Explained variance (%)	18.98	13.93	9.62	7.07	6.06	5.45	4.58
Cronbach's alpha	0.78	0.75	0.76	0.83	0.69	0.78	0.70

Note: Extraction method: Unweighted least squares; Rotation method: Varimax with Kaiser normalization.

Table 2 - Assessment of construct validity by different groups according to the score of socio-cognitive determinants from the scale factors by professional category, Rio das Ostras, Rio de Janeiro, Brazil, 2018-2019

Professional category				Factors			
	Int.	SI	OC	O	IC	A	EB
Nurse	4.77	3.56	2.50	4.79	3.52	4.59	4.26
Nurse technician	4.44	3.63	2.85	4.68	3.16	4.53	4.22
Physician	4.65	3.76	2.68	4.83	3.29	4.60	4.55

Note: Int - Intention to perform SPs; SI - Social influence; OC - Organizational Constraints; O - Organization; IC - Individual Constraints; A - Attitudes; EB - Exemplary Behaviors.

Items *8- Having equipment available in the health care setting; 9- To be trained in using standard precautions*; and *10- To receive reminders about standard precautions* were grouped under the factor 'organization'.

Items *11- The senior physician has exemplary behavior regarding adherence to standard precautions* and *12- My colleagues have exemplary behavior regarding adherence to standard precautions* were grouped under the factor 'exemplary behavior'.

Items *13- The occurrence of unanticipated events that adversely affect my work; 14- Lack of time; 15- Increased workload;* and *16- The complexity of the standard precautions protocol* were grouped under the factor 'organizational constraints'.

Items *17- Lack of knowledge about standard precautions; 18- Care team routine; 19- Personal beliefs about standard precautions*; and *20- Problems related to use of equipment* were grouped under the factor 'individual constraints'.

Items *21- Even if the patient is difficult; 22- Even if I am pressed for time; 23- Even if my hands are damaged or painful*; and *24- During an emergency situation* were grouped under the factor 'intention to perform SPs', which has the highest explained variance (18.9%).

Item 16 was allocated to two factors, but it ended up in the same factor as the original scale for presenting higher factor loading.

In the analysis of scores from the SPQ-PB factors according to professional category, nurses obtained a significant effect in scores of intention (4.77; p=0.000) and individual constraints (3.52; p=0.041), i.e., nurses presented greater intention to perform SPs when compared to physicians and nursing technicians. For the other factors in the questionnaire, no significant difference was observed between the professional categories.

DISCUSSION

When assessing the psychometric properties of the Brazilian Version of the SPQ (SPQ-PB), satisfactory results were obtained, that is, the SPQ-PB has demonstrated sufficient validity and reliability.

For the evaluation of psychometric properties, the study sample consisted of health professionals, including physicians and nursing professionals who provide care to patients. Most of these professionals were female, had not received training, were mostly from internal medicine and felt reasonably trained regarding the use of SPs. Since the sample was mostly made of nursing professionals, the findings agree with those reported by *Fundação* Oswaldo Cruz (Fiocruz), in a study requested by the Federal Nursing Council (Cofen), which found an 84.6%

prevalence of female participants when analyzing the profile of nursing teams in Brazil[19].

In terms of training on SPs, a considerable number of participants reported they had not received training on SPs. A similar result was found in a study that analyzed the level of compliance with SPs by nursing professionals from a teaching hospital in the country area of Minas Gerais, which reported that 53.1% of professionals had received some sort of training in the last six months[20].

In the reliability assessment for the internal consistency analysis, a satisfactory result was obtained. Values above 0.70 are acceptable and values closer to 1 indicate better reliability[21].

Instrument reliability is essential for analyzing correlations between the items. The studies related to SPs that assessed the reliability of instruments showed sufficient reliability[22-23].

Construct validity is the main measure of instrument validity. This type of validity can be assessed by known groups, convergent validity, discriminant validity, and the multitrait-multimethod matrix[13]. Factor analysis is a technique used to demonstrate the adequacy of construct representation, constituting a critical stage in the validation of psychological instruments[12].

The presence of seven factors was confirmed through exploratory factor analysis. All items of the instrument had satisfactory factor loading. Factor loadings above 0.30 are considered acceptable[12].

The assessment of construct validity by known groups conducted in this study showed the SPQ-PB is sensitive to differences, as demonstrated in the analysis of scores from the factors according to professional category, where nurses obtained a significant effect in scores of intention and individual constraints when compared to other professionals.

Moreover, validity by known groups is one of the simplest methods of construct validity, as specific groups may present different results from others and the instrument must be sensitive to these differences[13].

The SPQ-PB domains are focused on the assessment of socio-cognitive determinants of compliance with SPs, which include attitudes, behaviors, limitations, and individual and organizational constraints[10]. Although knowledge, risk perception and decision making are factors that may be related to compliance with SPs, they do not fully explain the failure to comply with these measures. Other obstacles have been reported, such as workload, availability of materials and the physical structure of health institutions[24].

In this sense, further studies analyzing this theme through the SPQ-PB can help expand the understanding of these phenomena and their causes. This instrument may help assess the determinants of compliance with SPs and develop new strategies to reduce the limitations found in this study.

Finally, after evaluating its psychometric properties, the SPQ-PB consisted of 24 items grouped into seven factors, and no item had to be excluded; in addition, the items remained under the same factors as the original scale[11]. Therefore, its validity and reliability are evident.

Study limitations

The main limitation of this study was the small number of physicians during the validation process. Nursing professionals were in bigger number, as their presence is higher in health services.

Contributions to the field of Nursing

Validation of an instrument that can measure the socio-cognitive determinants of compliance with SPs will help identify the factors related to these measures and then develop continuing education strategies and contribute to the safety of patients and health professionals.

CONCLUSIONS

The assessment process of the SPQ-PB psychometric properties provided positive results. Satisfactory reliability and construct validity were obtained, allowing a valid, reliable and consistent instrument for the assessment of socio-cognitive determinants of compliance with SPs by physicians and nursing professionals.

Therefore, this scale will help identify determinants of compliance with SPs for the development of intervention strategies, training and continuing education aiming to increase patient safety and reduce occupational risks among health professionals.

FUNDING

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